

Unit 5: Genetics

Meiosis

Meiosis is a process of nuclear division that reduces the number of chromosomes in new cells to half the number in the original cell.

For example, in humans, meiosis produces haploid reproductive cells, each called gametes. Human *gametes* are sperm cells and egg cells, each of which contains 23 (1n) chromosomes.

The fusion of a sperm and an egg results in a zygote (diploid cell) that contains 46 (2n) chromosomes.

Meiosis I

Synapsis – the pairing of homologous chromosomes during meiosis.

Tetrad – a pair of homologous chromosomes.

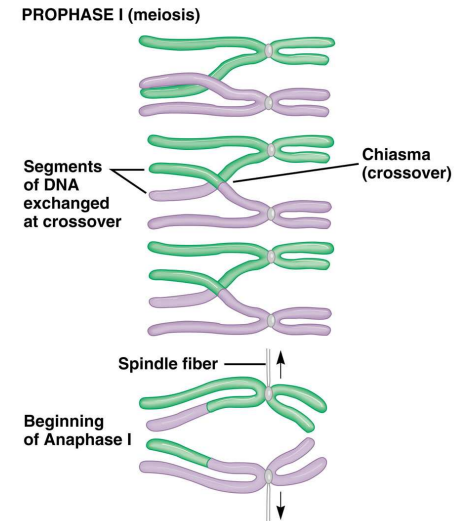
Crossing-over – portions of chromatids break off and attach to adjacent chromatids on the homologous chromosome. This permits exchange of genetic material between maternal and paternal chromosomes.

Genetic Recombination – mixing of genetic material; such as crossing over during meiosis.

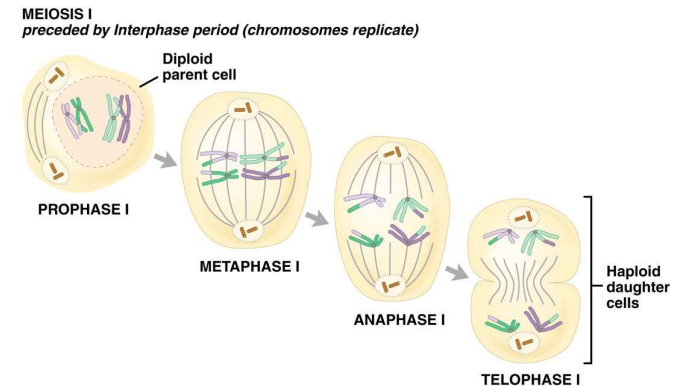
Prophase I

- DNA coils tightly into chromosomes.
- spindle fibers appear.
- nucleus & nucleolus disassemble.
- chromosomes line up next to their homologue.

-crossing over occurs of homologous chromosomes.



Metaphase I –tetrads line up randomly along cell midline.
 -spindle fibers from one pole attach to centromere of one homologous chromosome.
 -spindle fibers from opposite pole attach to the other homologous chromosome of the pair.



Anaphase I – each homologous chromosome moves to an opposite pole.

Independent Assortment – random separation of the maternal and paternal chromosomes, which result in genetic variation.

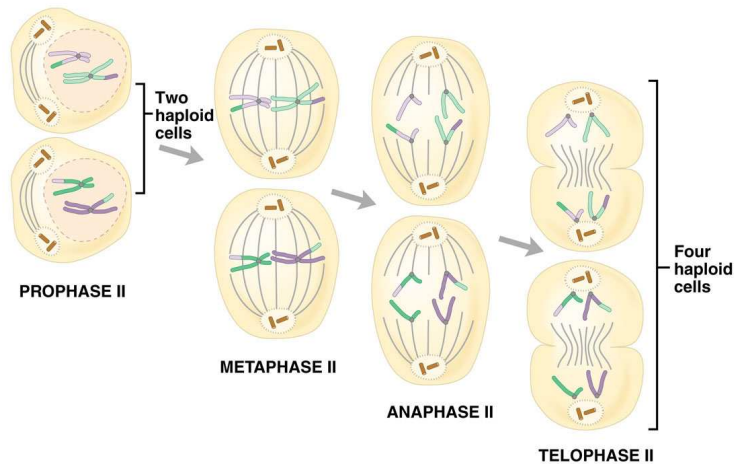
Telophase I – chromosomes reach opposite ends of cells.
- cytokinesis I occurs.
- new cells contain a haploid (1n) number.

Meiosis II

Prophase II – spindle fibers form and begin to move the chromosomes toward the midline of the dividing cell.

Metaphase II – chromosomes move to the midline of the dividing cell.

MEIOSIS II
preceded by Interphase-like period (cytokinesis)



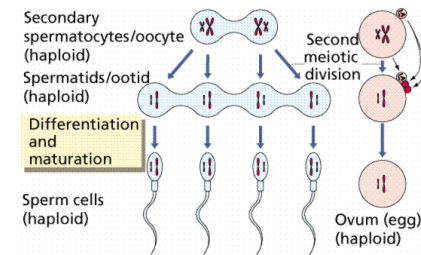
Anaphase II – chromatids separate and move toward opposite poles of the cell.

Telophase II – nuclear membrane form around chromosomes in each of the 4 new cells.
- cytokinesis II occurs forming 4 new cells.
- each cell contains half (haploid –1n) of the original cell's number of chromosomes.

Formation of Gametes

Spermatogenesis – the production of sperm cells.

A.) **Spermatids** – immature sperm cells.



Oogenesis – production of mature egg cells.

- during meiosis, one egg cell is produced along with 3 polar bodies.
- egg cell receives most of the original cell's cytoplasm.

A.) **Polar Bodies** – 3 degenerate products of ova meiosis.

